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[54] **REFRIGERATOR AND METHOD FOR CIRCULATING COLD AIR THEREIN**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **62/443**; 62/408; 62/276

[58] **Field of Search** 62/404, 407, 408, 62/443, 441, 272, 275, 276

[56] **References Cited**

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[57] **ABSTRACT**

A refrigerator and a method for circulating cold air in the refrigerator are provided for blocking the backward stream of cold air within a freezing chamber and a main cold air duct into a cold chamber regardless of occurrence of a pressure difference caused by different supply amount of the cold air to the freezing chamber and cold chamber, thereby preventing freezing of food within the cold chamber. For this, an evaporator produces the cold air supplied to the freezing chamber, and a fan apparatus draws in the cold air within the freezing chamber. Ducts allowing for the flow of the cold air includes the main cold air duct which leads the cold air admitted from the fan apparatus to return to the freezing chamber via the evaporator, a cooling duct branched from the main cold air duct to supply the cold air to the cold chamber and a cold air return duct for leading the cold air within the cold chamber to return to the evaporator.

4 Claims, 2 Drawing Sheets

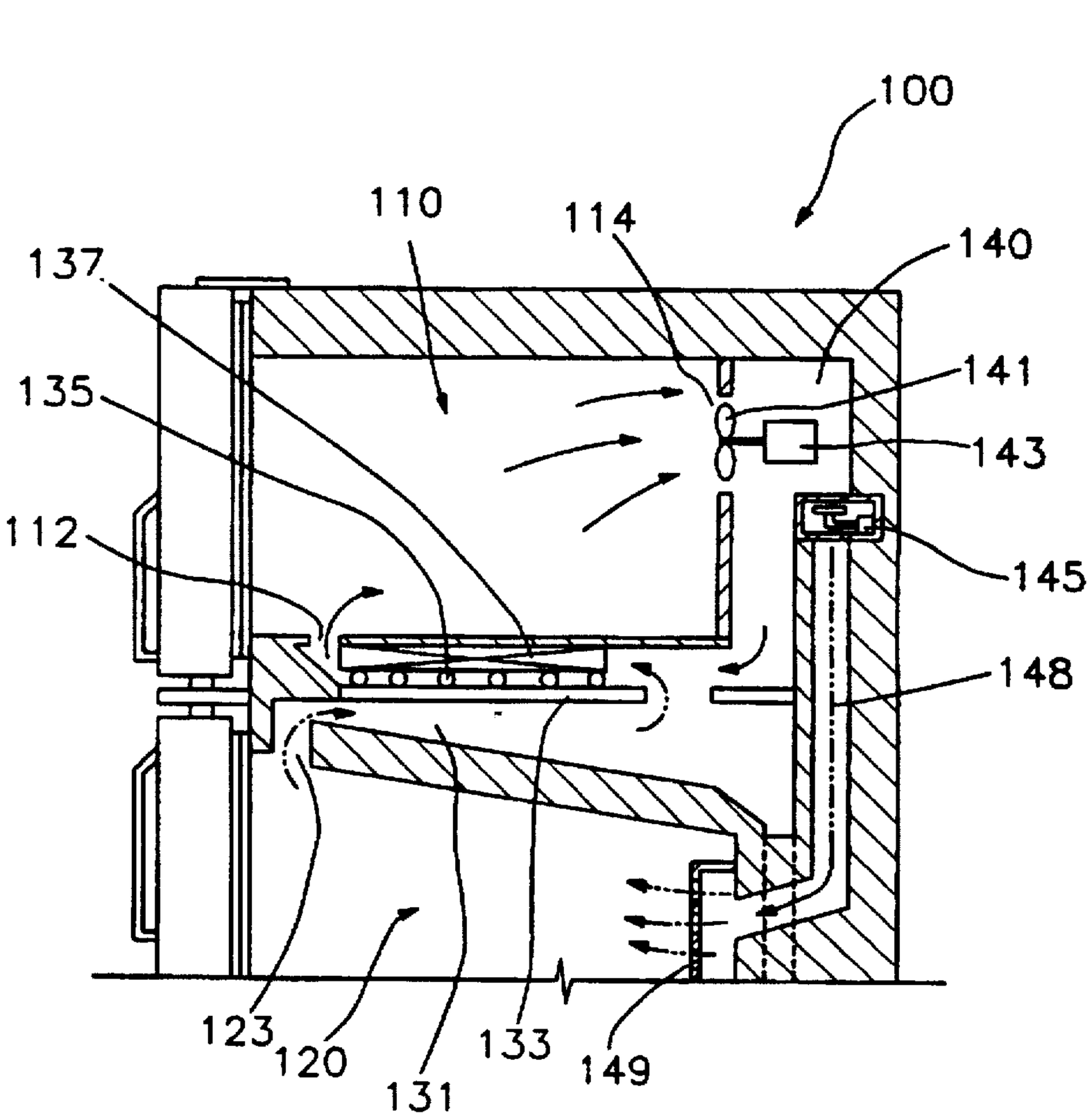


FIG. 1
PRIOR ART

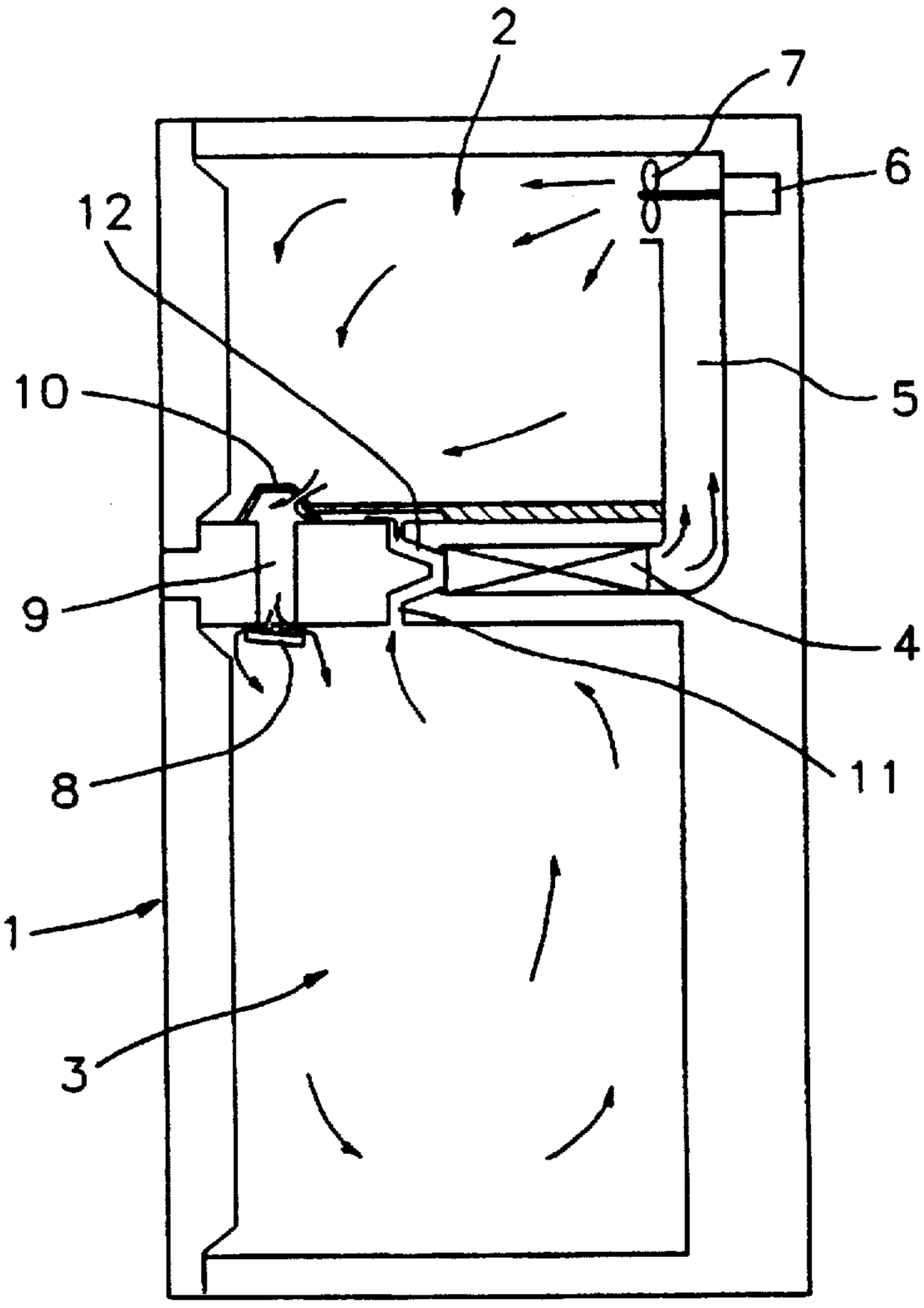
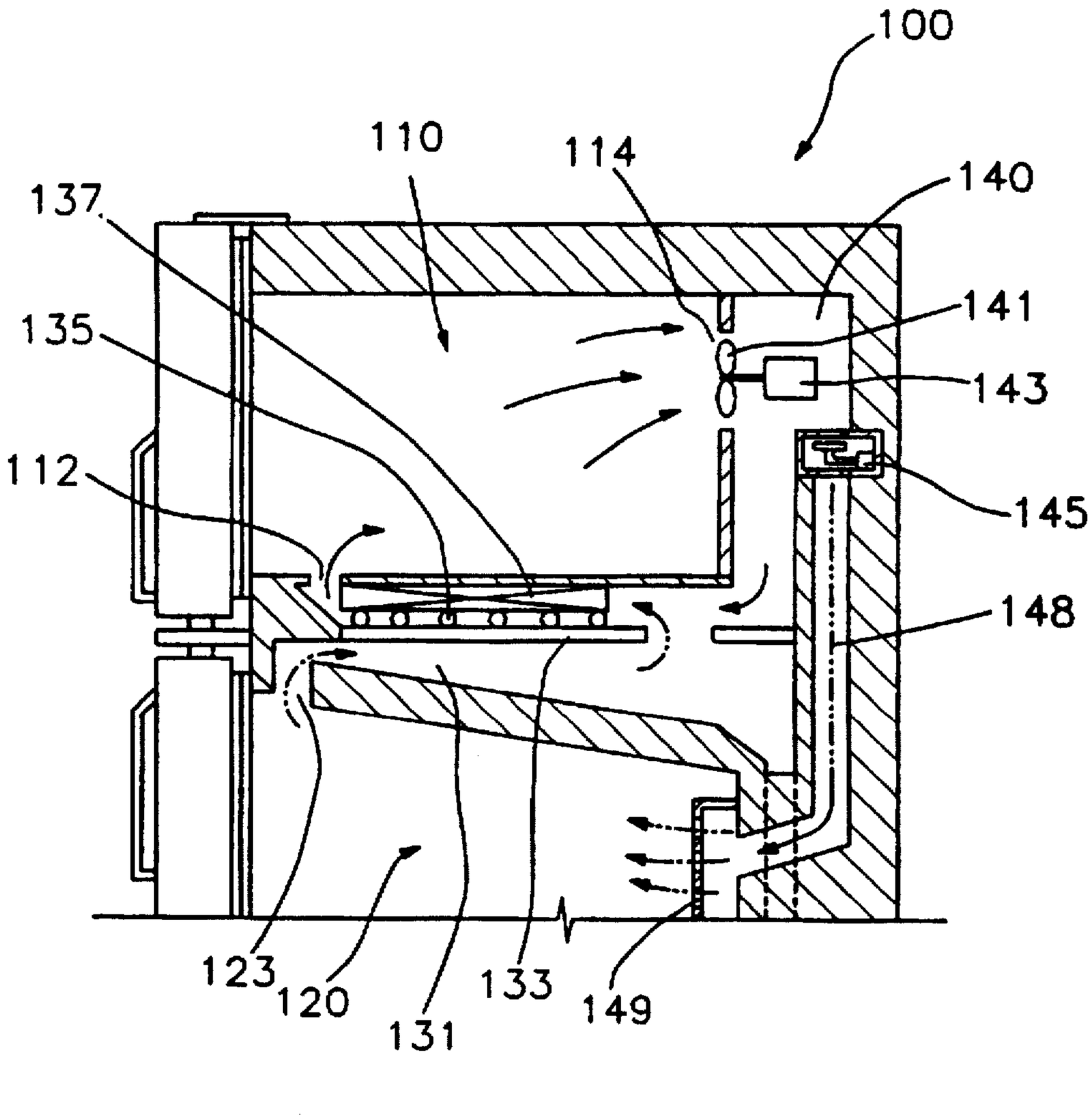


FIG.2



REFRIGERATOR AND METHOD FOR CIRCULATING COLD AIR THEREIN

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a refrigerator, and more particularly, to a refrigerator wherein a structure of a duct for supplying cold air required for freezing and cooling operation therein is changed, and a method for circulating the cold air in the refrigerator.

2. Description of the Prior Art

A refrigerator is generally divided into a freezing chamber and a cold chamber. FIG. **1** illustrates a sectional view of such a conventional refrigerator. As shown in FIG. **1**, refrigerator **1** is partitioned into freezing chamber **2** in the upper end and cold chamber **3** in the lower end. Also, a plurality of cold air ducts which allow for the flow of the cold air, an evaporator **4** and the like are provided thereto.

A cooling fan **7** and a fan motor **6** for ejecting the cold air to the interior of freezing chamber **2** are installed to the upper portion of the rear side of freezing chamber **2**. A cold air suction pipe **10** for drawing in the cold air within freezing chamber **10** is provided in the door area of the bottom plane of freezing chamber **2**.

Cold air suction pipe **10** is branched into a cold air guide opening **9** heading toward cold chamber **3** and a first suction port **12** heading toward evaporator **4**. First suction port **12** is connected to evaporator **4** of which one side is connected to a main cold air duct **5**. Main cold air duct **5** is open at the upper end of freezing chamber **2** while including cooling fan **7** and fan motor **6**.

Cold air guide opening **9** branched from cold air suction pipe **10** is connected to be communicated with the interior of cold chamber **3**, and a flow path switching device **8** is installed to the outlet side of cold air guide opening **9**. A second suction port **11** for drawing in the cold air of cold chamber **3** is formed at one side of the upper portion of cold chamber **3**, which is connected to a portion of connecting first suction port **12** to evaporator **4**.

The above-stated freezing chamber **2** and cold chamber **3** of refrigerator **1** are operated as below. Upon the generation of the cold air from evaporator **4** by the expansion of a refrigerant gas, the cold air is forcibly blown within main cold air duct **5** by means of cooling fan **7** rotated together with fan motor **6**. The forcibly blown cold air is ejected to the interior of freezing chamber **2** via the outlet side of main cold air duct **5** to maintain the interior of freezing chamber **2** under a proper ambience.

The cold air within freezing chamber **2** is drawn in via cold air suction pipe **10**, so that some of the cold air are directed toward evaporator **4** via first suction port **12** and some are sent to cold chamber **3** via cold air guide opening **9**. At this time, the cold air having passed through first suction port **12** is mixed with that having passed through second suction port **11** to be admitted into evaporator **4**, thereby executing the heat exchange.

In accordance with the above-described procedure, the freezing and cooling operation of conventional refrigerator **1** is accomplished.

In conventional refrigerator **1**, however, cooling fan **7** is installed to the rear side of freezing chamber **2**. For this reason, when cooling fan **7** is operated, the cold air is directly supplied to freezing chamber **2** but is indirectly supplied to cold chamber **3**. Thus, the supply amount of the cold air to freezing chamber **2** and cold chamber **3** differs

from each other to cause a pressure difference. Once the pressure difference appears, the cold air of freezing chamber **2** flows from first suction port **12** to second suction port **11** or streams backward in main cold air duct **5**. Consequently, a temperature in cold chamber **3** is lowered down from a predetermined temperature, which results in problems such as freezing of food within cold chamber **3**.

SUMMARY OF THE INVENTION

The present invention is devised to solve the foregoing problems. Therefore, it is an object of the present invention to provide a refrigerator having a cold air duct for preventing the backward flow of cold air of a freezing chamber and a main cold air duct and a method for circulating the cold air in the refrigerator.

To achieve the above object of the present invention, there is provided a refrigerator which includes an evaporator for generating cold air supplied to a freezing chamber, and a fan apparatus for drawing in the cold air within freezing chamber. The fan apparatus is connected to a main cold air duct of which one side is connected to the freezing chamber for leading the cold air admitted from the fan apparatus to return to the freezing chamber via the evaporator. A cooling duct branched from the main cold air duct supplies the cold air to a cold chamber, and a cold air return duct has one side connected to the cold chamber and another side connected to the main cold air duct for leading the cold air within the cold chamber to return to the evaporator.

Here, it is preferable that the evaporator is installed within the main cold air duct, and especially placed between the freezing chamber and cold chamber within the main cold air duct.

In addition, a defroster may be installed to the evaporator for removing frost created to the evaporator, which may be formed of an electric heater for producing heat, and an abutting plate for transmitting the heat produced from the electric heater to the evaporator.

Preferably, the fan apparatus is installed to the upper portion of the rear side of the freezing chamber, and the other side of the main cold air duct is installed to the door area of the bottom plane of the freezing chamber.

Also, a damper is further installed to one side of the cooling duct for adjusting the quantity of the cold air flowing toward the cold chamber.

At this time, one side of the cold air return duct is installed to the upper portion of the door area of the cold chamber, another side of the cold air return duct consists of the abutting plate, and the other side of the cold air return duct is connected to the main cold air duct heading toward the evaporator.

To settle the above object of the present invention, a refrigerator includes an evaporator for generating cold air supplied to a freezing chamber, a fan apparatus for drawing in the cold air within freezing chamber, a main cold air duct having one side connected to the fan apparatus and another side connected to the freezing chamber for leading the cold air admitted from the fan apparatus to return to the freezing chamber via the evaporator, a cooling duct branched from the main cold air duct for supplying the cold air to a cold chamber, and a cold air return duct having one side connected to the cold chamber and another side connected to the main cold air duct for leading the cold air within the cold chamber to return to the evaporator. In this construction, the evaporator which is placed between the freezing chamber and cold chamber within the main cold air duct is formed of an electric heater for producing heat and an abutting plate for

transmitting the heat produced from the electric heater to the evaporator, the fan apparatus is installed to the upper portion of the rear side of the freezing chamber, the other side of the main cold air duct is installed to the door area of the bottom plane of the freezing chamber, and a damper is installed to one side of the cooling duct for adjusting the quantity of the cold air flowing toward the cold chamber. Also, one side of the cold air return duct is installed to the upper portion of the door area of the cold chamber, another side of the cold air return duct is formed of the abutting plate, and the other side of the cold air return duct is connected to the main cold air duct heading toward the evaporator.

To achieve the above object of the present invention, a method for circulating cold air in a refrigerator is carried out by the step of supplying the cold air produced from an evaporator to a freezing chamber, drawing in the cold air within the freezing chamber by means of a fan apparatus, and leading the cold air drawn in from the fan apparatus by means of a main cold air duct having one side connected to the fan apparatus and another side connected to the freezing chamber to return to the freezing chamber via the evaporator. Then, the cold air branched from the main cold air duct is supplied to a cold chamber, and the cold air within the cold air returns to the evaporator via the cold air return duct having one side connected to the cold chamber and the other side connected to the main cold air duct.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and other advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. **1** is a sectional view showing a conventional refrigerator; and

FIG. **2** is a sectional view showing a freezing chamber section in a refrigerator according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **2** illustrates a sectional view of a freezing chamber of a refrigerator according to the present invention.

Referring to FIG. **2**, the interior of refrigerator **100** is divided into freezing chamber **110** and a cold chamber **120**. A space called as a main cold air duct **140** is formed between freezing chamber **110** and cold chamber **120** and in the rear side of freezing chamber **110**.

One side of main cold air duct **140** is open at the upper portion of the rear side of freezing chamber **110** while forming a cold air suction hole **114**, and another side thereof is open at the door area of the bottom plane of freezing chamber **110** while constituting a cold air ejecting outlet **112**. Cold air suction hole **114** is installed with a cooling fan **141** and a fan motor **143** for taking in the cold air within freezing chamber **110**, and a cooling duct **148** connected to cold chamber **120** is branched in an area downwardly proceeding along main cold air duct **140**.

One side of cooling duct **148** is connected to main cold air duct **140**, and a damper **145** for adjusting the flow of the cold air is installed to their connecting portion. Damper **145** is internally furnished with a temperature sensing section (not shown) and a cold air switching device (not shown) to function by monitoring the temperature within cold chamber **120** and adjusting the quantity of the cold air flowing through cooling duct **148** in correspondence to the monitored temperature. The other side of cooling duct **148** is connected until reaching the rear side within cold chamber **120** to be connected to the interior of cold chamber **120** via cold air ejecting outlet **149**.

A cold air suction port **123** for the use in cold chamber **120** for drawing in the cold air within cold chamber **120** is provided to the door area of the upper portion of cold chamber **120**. Cold air suction port **123** for the use in cold chamber **120** constitutes one side of a cold air return duct **131** of which another side is connected to main cold air duct **140** via a hole formed in an abutting plate **133**.

An evaporator **137** is installed within main cold air duct **140** which passes between freezing chamber **110** and cold chamber **120**, and an electric heater **135** and abutting plate **133** are attached thereto for eliminating frost produced from evaporator **137**. Electric heater **135** is installed to contact between evaporator **137** and abutting plate **133**. One side of abutting plate **133** which is formed of a metal substance having a good heat transmission property contacts electric heater **135** and the opposite side forms one surface of cold air return duct **131**.

Operation and effect of the refrigerator having the above-described construction will be described below.

The cold air within freezing chamber **110** passes through cold air suction hole **114** to be admitted to the interior of main cold air duct **140** in accordance with the rotation of cooling fan **141**. The admitted cold air downwardly flows along main cold air duct **140** and is mixed with the cold air of cold chamber **120** at the point of encountering cold air return duct **131** prior to passing through evaporator **137**. The cold air which exchanges the heat while passing through evaporator **137** is ejected to the interior of freezing chamber **110** again via cold air ejecting outlet **112**.

When the temperature in cold chamber **120** exceeds a predetermined temperature, damper **145** is operated to lead some of the cold air downwardly proceeding within main cold air duct **140** to flow through cooling duct **148**. The cold air downwardly proceeding within cooling duct **148** is ejected to the interior of cold chamber **120** via cold air ejecting outlet **149** for the use in cold chamber **120**. The ejected cold air circulates through cold chamber **120**, and is admitted into cold air return duct **131** via cold air suction port **123**. The cold air admitted to the interior of cold air return duct **131** flows to the backward side of refrigerator **100** to pass through the hole formed in abutting plate **133**, thereby being mixed with the cold air flowing through main cold air duct **140**.

If the temperature within cold chamber **120** is below the predetermined temperature, damper **145** closes one side of cooling duct **148** to block the flow of the cold air toward cold chamber **120**. In this case, the cold air is not supplied to cold chamber **120** but is ejected to the interior of freezing chamber **110** via evaporator **137** directly from main cold air duct **140**. That is, the cold air circulates only through freezing chamber **110**.

Also, the cold air returning from cold chamber **120** to evaporator **137** is relatively high in temperature and humidity. Thus, if evaporator **137** is frosted, electric heater **135** is operated to generate the heat required for defrosting. The generated heat is supplied to evaporator **137** directly or via abutting plate **133** to melt the frost.

As a result, even though the pressure differs due to the different amount of the cold air supplied into freezing chamber **110** and cold chamber **120**, the backward flow of the cold air of freezing chamber **110** and main cold air duct **140** is blocked to prevent freezing of the food within cold chamber **120**.

While the present invention has been particularly shown and described with reference to particular embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A refrigerator comprising:

an evaporator for generating cold air to be supplied to a freezing chamber;

a fan apparatus for drawing in said cold air within said freezing chamber;

a main cold air duct having one side connected to said fan apparatus and another side connected to said freezing chamber for leading said cold air admitted from said fan apparatus to return to said freezing chamber via said evaporator, said evaporator being installed within said main cold air duct;

defroster means installed to said evaporator for removing frost formed in said evaporator, said defroster means having an electric heater for producing heat and an abutting plate for transmitting said heat produced from said electric heater to said evaporator;

a cooling duct branched from said main cold air duct for supplying said cold air to a cold chamber;

a cold air return duct having one side connected to an upper portion of a door area of said cold chamber and another side connected to a lower portion of said main cold air duct for leading said cold air within said cold chamber to return to said evaporator through a cold air suction port formed in said abutting plate; and

a damper installed to one side of said cooling duct for adjusting a quantity of cold air flowing toward said cold chamber according to a temperature in said cold chamber,

wherein said evaporator is placed between said freezing chamber and said cold chamber within said main cold air duct, and one side of said cold air return duct is comprised of said abutting plate.

2. A refrigerator as claimed in claim 1, wherein said fan apparatus is installed to the upper portion of the rear side of said freezing chamber.

3. A refrigerator as claimed in claim 1, wherein another side of said main cold air duct is installed to the door area of the bottom plane of said freezing chamber.

4. A refrigerator as claimed in claim 1, wherein said cold air return duct is connected to said main cold air duct heading toward said evaporator.

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